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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/581,500	06/02/2006	Masuaki Okada	YANE-0004-US1	3844

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EXAMINER	
CHIMIAK, EMILY ANN	
ART UNIT	**PAPER NUMBER**
1791	

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11/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/581,500	OKADA, MASUAKI	
	Examiner	Art Unit	
	Emily Chimiak	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-7,12 and 14-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,-7,12 and 14-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of group I, claims 1, 3-7 and 9-18 in the reply filed on 10/01/2007 is acknowledged

Applicant's election of Species D, claims 12 and 31, in the reply filed on 8/24/07 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). It is noted that claims 9, 10, 11, and 13 and 28, 29, 30 and 32 are withdrawn.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 3-7, 14 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagakubo et al. (US 5904860).

As to claim 1, Nagakubo et al. discloses a method for bonding objects at a low temperature after subjecting the bonding surfaces of the objects to be bonded to a hydrophilic treatment using a plasma (col. 1 lines 8-25 and col. 2 lines 25-30). The method comprises:

- a surface activation step of performing said hydrophilic treatment by means of a plasma treatment means for changing an ion strike force (col. 4 lines 8-14)

  wherein said surface activation step comprises:

  - a physical treatment step of subjecting both said objects to be bonded to a physical treatment using said plasma having a strong ion strike force, thereby etching surfaces of the objects to be bonded, or replacing surface molecules of the surfaces with ion molecules which strike the surfaces, or making the ion molecules adhere to the surfaces, in a first half of the plasma treatment (col. 4 lines 28-46)

  - a chemical treatment step of subjecting the surfaces of both said objects to be bonded to a chemical treatment using active radicals, or active ions having a weak ion strike force of said plasma of which the ion strike force is reduced by means of said plasma treatment means, in a second half of the plasma treamtment after said physical treatment step (col. 4 lines 1-4 and 48-65).

In one embodiment, Nagakubo et al. discloses that the reactive gases can be hydrogen and ammonia, in order to add hydrogen atoms to the dangling bonds of oxygen atoms on the surface of the second body. However, one of ordinary skill in the art would know to use oxygen

as one of the reactive gases in the case where the second bonding member lacks oxygen on the surface, such as when it is metal or an IC chip with a protective film such as Si_3N_4 (col. 1 lines 12-25).

One of ordinary skill reading the reference would bond at the lowest effective temperature, i.e. less than 500°C because Nagakubo et al. bonds at a low temperature (col. 3 lines 30-31).

As to claim 3, the rejection of claim 2 above is relied on.

As to claim 4, a vacuum is maintained in vacuum chamber 11 (col. 3 lines 35-40 and Figure 2).

As to claim 5, a gas containing H is introduced and mixed before bonding (col. 4 lines 45-50).

As to claim 6, a reaction gas of the physical treatment step in one embodiment is different from a gas of said chemical treatment step, and is Ar (col. 3 lines 57-58 and col. 4 lines 1-5).

As to claim 7, the physical treatment step and chemical treatment step are performed in a vacuum chamber under a vacuum, i.e. without exposure to the atmospheric air (col. 3 lines 35-40).

As to claims 14 and 15, the rejection of claim 1 above is relied on.

As to claim 16, Nagakubo discloses maintaining the plasma generating source power during bonding (col. 6 lines 23-30).

As to claim 17, Nagakubo et al. discloses that at least one of the objects to be bonded are made of a ceramic in one embodiment (col. 1 lines 13-20).

As to claim 18, the object to be bonded is a wafer or chip in one embodiment (col. 1 lines 13-25).

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagakubo et al. as applied to claim 1 above, and further in view of Li et al. (US 6299787).

Nagakubo et al. discloses changing the ion strike force in order to prepare the surface of the members for bonding, wherein one member is nitrous and the other member can be non-nitride, such as a polymeric compound (col. 1 lines 10-28). One reading the reference as a whole would realize that the reference is not concerned with the method of generating plasma because although Nagakubo et al. discloses using electron cyclotron resonance that is tuned to generate plasma of the desired ion strike force, in the described embodiment, the reference teaches that other techniques may be used to generate the plasma (col. 5 lines 34-40).

However, it is uncertain whether Nagakubo et al. teaches replacing the ECR with a plasma electrode including an object-to-be-bonded holding electrode and a counter surface electrode which are provided at two positions and can be used for said plasma electrode alternatively.

Li et al. teaches that a polymeric material may be treated in a continuous production line by passing the polymer to be treated through a serious of physically separated plasma electrodes (col. 3 lines 35-48).

It would have been obvious to one of ordinary skill in the art at the time of invention to use a series of rooms with plasma emitting means as taught by Li et al. instead of reducing the

ion strike force on one plasma emitting means as taught by Nagakubo et al. in order to increase the efficiency of the process by making it continuous.

6. Claims 1-7 and 14 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagakubo et al. as applied to claim 1 above, and further in view of the admitted prior art.

As to claim 1, in one embodiment, Nagakubo et al. discloses that the reactive gases can be hydrogen and ammonia, in order to add hydrogen atoms to the dangling bonds of oxygen atoms on the surface of the second body. However, one of ordinary skill in the art would know to use oxygen as one of the reactive gases on a surface that lacks oxygen atoms at the surface, such as when it is metal or an IC chip with a protective film such as Si_3N_4 (col. 1 lines 12-25). In case Nagakubo et al. is not considered to teach using oxygen as one of the reactive gases, the following argument is presented:

Applicant discloses that it is known in the art to use oxygen as a reactive gas to alter the surface of an object to be bonded using oxygen plasma to form a hydrogen bond (see page 1 of the specifications). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use oxygen as one of the reactive gases in the method disclosed by Nagakubo et al. because it is known in the art to use oxygen plasma in order to modify an object to be bonded including forming a hydrogen bond.

Claims 2-7 and 14-18, the rejection of these claims above is relied on.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagakubo et al. and the admitted prior art as applied to claim 1 above, and further in view of Li.

Claim 12 is rejected as before.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagakubo et al. and the admitted prior art as applied to claim 1 above, and further in view of Wagner et al. (US 4871433).

Nagakubo et al. discloses that sputter etching may be used in place of the inert gas cleaning step from the illustrative example. The inert gas of this step is argon in one embodiment, but one reading the reference as a whole would realize that Nagakubo et al. is not concerned with a particular inert gas or a particular reactive gas because there are no restrictions as to what may be used for the gas (col. 3 lines 55-60, col. 4 lines 1-5 and col. 5 lines 24-26). The second half of the plasma etching procedure includes a reaction gas that contains nitrogen in one embodiment (see col. 4 lines 4-5).

It is unclear whether Nagakubo et al. discloses that the plasma reaction gas is switched from a reaction gas containing oxygen in said physical treatment step to a reaction gas containing nitrogen during a plasma treatment using a reduced ion strike force in said second half of the plasma treatment.

However, Wagner et al. discloses that it is known in the art to include oxygen with argon in the sputtering chamber in order to cause film removal to proceed more effectively (col. 1 lines 60-65).

It would have been obvious to one of ordinary skill in the art at the time of invention to use oxygen and argon in the sputter etching step disclosed by Nagakubo et al. because Wagner et

al. teaches that the oxygen radicals will react with the substrate to form volatile compounds at the same time as the substrate is being struck by argon, for a more effective sputtering technique.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Emily Chimiak whose telephone number is (571)272-6486. The examiner can normally be reached on Monday-Friday 8:30-5:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571)272-6486. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EAC

/John L. Goff/
Primary Examiner
Art Unit 1791